Results: The MR-linac platform is in the last phase of the assessment. At its pre-defined imaging position in the linac room, the MR was shimmed and configured to work at peak performance. The linac's radiation beam output was also found to be within specifications, being not affected by multiple passive exposures (testing over one year) to the MR's magnetic fringe field. A hybrid MR-kV framework is under development to enable comprehensive RT tools for MR-only RT planning, quantification of organ motion (fast imaging), in-room treatment guidance, and site specific adaptive RT workflows. QC procedures specific to the MR and linac integration were also developed for the mapping and correction of both scanner-related and patient-induced MR image distortions, mutual registration of the MR and linac isocenters, B0 mapping for monitoring the MR performance, 4D MR, and generation of synthetic CT data sets.

Conclusion: Key milestones of the MR and linac integration were achieved, supporting the feasibility of the system for clinical implementation.

OC-0544

Heterogeneous FDG-guided dose escalation of locally advanced NSCLC, the NARLAL2 phase III trial

D.S. Moeller[1], L. Hoffmann[1], C.M. Lutz[1], T.B. Nielsen[2], C. Brink[2], A.L. Appelt[3], M.D. Lund[3], M.S. Nielsen[4], W. Ottosson[5], A.A. Khalil[1], M.M. Knap[1], O. Hansen[2], T. Schytte[2]

[1]Aarhus University Hospital, Department of Oncology and Medical Physics, Aarhus, Denmark

[2]Odense University Hospital, Laboratory of Radiation Physics and Department of Oncology, Odense, Denmark

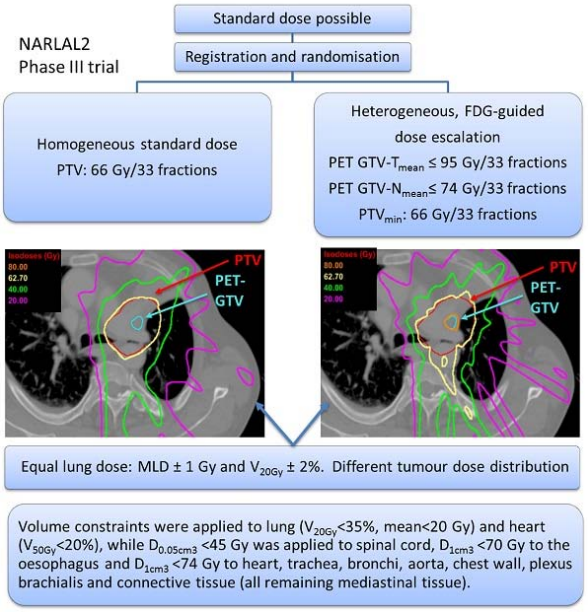
[3]Vejle Hospital, Department of Oncology, Vejle, Denmark

[4]Aalborg University Hospital, Department of Oncology, Aalborg, Denmark

[5]Herlev Hospital, Radiotherapy Research Unit and Department of Oncology, Herlev, Denmark

Purpose or Objective: Locally advanced lung cancer lacks effective treatment options and may require aggressive chemo-radiotherapy (RT) with high doses. In the light of the RTOG 0617 trial, multi-centre dose escalation trials should avoid increasing organ at risk (OAR) toxicity and require strict quality assurance (QA). Dose escalation can be performed for sub volumes of the tumour by targeting of the most FDG-PET avid regions, and the planning target volume (PTV) can be reduced by implementing daily soft tissue based image-guidance and adaptive RT. Incorporating these elements, the randomized multi-centre trial NARLAL2 by the Danish Oncologic Lung Cancer Group aims at increasing loco-regional control at 30 months without increasing toxicity.

Material and Methods: In the standard arm, the PTV is treated with a homogenous dose of 66 Gy/33 fractions (fx). In the experimental arm, the dose is escalated heterogeneously to the FDG-PET avid volumes, with mean doses up to 95 Gy/33 fx for the most PET active volumes of the primary tumour, and 74 Gy/33 fx for malignant lymph nodes ≥ 4 cm3. The escalation dose is limited in favour of OAR constraints. A standard and an experimental treatment plan are optimized for each patient prior to randomization. Dose to the lung in the experimental plan is kept similar to the lung dose in the standard plan. All enrolment centres were obliged to follow a strict QA program consisting of a treatment planning study, a soft tissue match and adaptive strategy workshop, and QA for PET scanners and FDG-PET volume delineation. In the present study, the dose distributions of the first 20 patients are analysed. The achieved dose escalation is compared to a previously conducted pilot study.



Results: In the pilot study, the dose escalated FDG-PET avid part of tumour (PET GTV-T) and lymph nodes (PET GTV-N) received an average mean dose of 91.9 Gy and 72.1 Gy, respectively. The combined clinical target volume (CTV-total) received an average mean dose of 78.6 Gy. This corresponds to a 16 % estimated increase in loco-regional control at 30 months. For the first 20 patients included, the experimental plan achieved an average mean dose of 92.3 Gy (SD 3.7) to PET GTV-T. A total of 11 large lymph nodes were escalated to an average mean dose of 72.1 Gy (SD 2.7) to PET GTV-N. CTV-total obtained an average mean dose of 75.8 Gy (SD 4.1). Normal tissue doses were similar for the experimental and standard plan (Table 1). The maximum dose for the standard plans was 72.6 Gy (110%). Higher doses were applied for the experimental plans, but only to small volumes respecting the strict normal tissue constraints (see figure).

Table 1: Dose to organs at risk (in absolute dose or percentage) as an average (with standard deviation) for the first 20 patients included.

Organ at risk	Standard (S)	Exp. (E)	E-S
Mean Lung Dose [Gy]	13.7 (3.7)	13.6 (3.8)	-0.1 (0.4)
Lung V$_{20Gy}$ [%]	22.0 (7.2)	21.4 (7.2)	-0.6 (0.6)
Mean Heart Dose [Gy]	8.4 (8.6)	8.2 (8.1)	-0.8 (0.8)
Heart V$_{50Gy}$ [%]	4.2 (3.9)	2.9 (3.9)	-0.6 (1.1)
Oesophagus V$_{35Gy}$ [%]	25.1 (13.7)	24.3 (14.0)	-0.8 (2.0)

Conclusion: A dose escalation trial with strict QA has been set up. Patient enrolment started January 2015. Analysis of the first 20 patients demonstrates that the escalation goals were met for the target and that dose to OARs were similar for the standard and the experimental treatment plans.

OC-0545

Results of a national audit of IMRT and VMAT patient QA

E. Seravalli[1], A.C. Houweling[2], M.P.R. Van Gellekom[3], J. Kaas[4], M. Kuik[5], E.A. Loeff[6], T.A. Raaben[7], J.A. De Pooter[8], J.H.W. De Vries[9], J.B. Van de Kamer[4]

[1]UMC Utrecht, Department of Radiation Oncology, Utrecht, The Netherlands

[2]Academic Medical Center, Department of Radiation Oncology, Amsterdam, The Netherlands

[3]Radiotherapiegroep, Department of Medical Physics, Arnhem, The Netherlands

[4]The Netherlands Cancer Institute, Department of Radiation Oncology, Amsterdam, The Netherlands

[5]Medisch Centrum Alkmaar, Department of Radiotherapy, Alkmaar, The Netherlands

[6]Erasmus MC-Cancer Institute, Department of Radiation Oncology, Rotterdam, The Netherlands